Review 17 Euler's method

approximates solutions to diff. equations (initial value problems)

iterate

$$\boxed{y_n = y_{n-1} + \frac{dy}{dx} \cdot \Delta x}$$

need to be given: $\frac{dy}{dx}$, (x_0, y_0) initial values, Δx

also need x_n

x	y	y'
x_0	y_0	
x_1		
x_2		
$\vdots$		
x_n		

$\Delta x <$

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Ex 1. $\frac{dy}{dx} = x - y - 1$ $f(1) = -2$ $f(1.4) = ?$

use Euler's, with 2 equal steps $\Delta x = .2$

x	y	y'
1	-2	2
1.2	-1.6	1.8
1.4	-1.24	

$y = -2 + (2)(.2) = -2 + .4$

$y = -1.6 + (1.8)(.2) = -1.6 + .36$

$$\begin{array}{r} 1.60 \\ -.36 \\ \hline 1.24 \end{array}$$

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$\hat{v} = \langle \frac{dx}{dt}, \frac{dy}{dt} \rangle$

Ex 2 velocity vector for a moving particle is $\hat{v} = \langle x+t, 2 \rangle$. If the particle starts at the origin, approximate x when $t = .3$. use $\Delta t = .1$

$\frac{dx}{dt} = x + t$

t	x	x'	
0	0	0	
.1	0	.1	$0 + 0(.1)$
.2	.01	.21	$0 + (.1)(.1)$
.3	.031		$.01 + (.21)(.1)$

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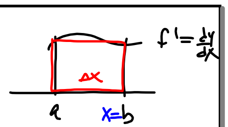
whey sick



$y_n = y_{n-1} + \frac{dy}{dx} \Delta x$

$f(b) = f(a) + \int_a^b f'(t)\, dt$

$f(x) = f(a) + f'(a)(x-a)$

tan line $y_2 = y_1 + m(x-a)$

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